PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :		(11) International Publication Number: WO 93/13881
B08B 15/02, F24C 15/20	A1	(43) International Publication Date: 22 July 1993 (22.07.93)

(21) International Application Number: PCT/SE93/00029

(22) International Filing Date: 20 January 1993 (20.01.93)

(30) Priority data:
9200161-9 21 January 1992 (21.01.92) SE

(71) Applicant: FUTURUM AB [SE/SE]; Box 9, S-930 47 Byske (SE).

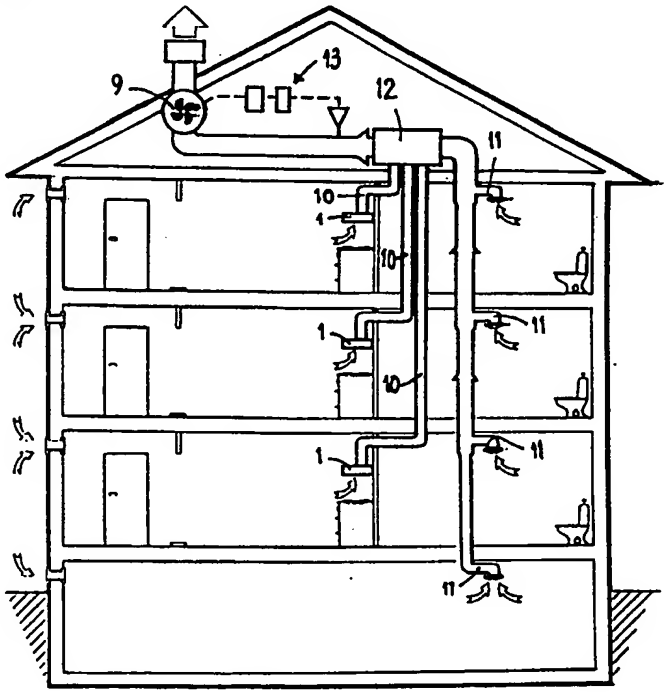
(72) Inventors: HEDMAN, Per-Martin ; Falmyrvägen 22, S-931 53 Skellefteå (SE). WALLIN, Sven-Olov ; Markvägen 10, S-934 32 Kåge (SE).

(74) Agents: LAGMAN, Sven et al.; H. Albihns Patentbyrå AB, Box 3137, S-103 62 Stockholm (SE).

(81) Designated States: FI, NO, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: VENTILATION SYSTEM



(57) Abstract

The present invention relates to a ventilation system comprising a central fan (9) to provide basic ventilation in one or more rooms in a building, and at least one range hood (1) for sucking up cooking odors, said range hoods being connected via a kitchen flue (10) to the central fan. According to the invention, a fan is added to the range hood, the suction side of said fan being connected to the space under the range hood and the pressure side of said fan being connected to the kitchen flue.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria
AU	Australia
BB	Barbados
BE	Belgium
BF	Burkina Faso
BG	Bulgaria
BJ	Benin
BR	Brazil
CA	Canada
CF	Central African Republic
CG	Congo
CH	Switzerland
CI	Côte d'Ivoire
CM	Cameroon
CS	Czechoslovakia
CZ	Czech Republic
DE	Germany
DK	Denmark
ES	Spain
FI	Finland
FR	France
GA	Gabon
GB	United Kingdom
GN	Guinea
GR	Greece
HU	Hungary
IE	Ireland
IT	Italy
JP	Japan
KP	Democratic People's Republic of Korea
KR	Republic of Korea
KZ	Kazakhstan
LI	Liechtenstein
LK	Sri Lanka
LU	Luxembourg
MC	Monaco
MG	Madagascar
ML	Mali
MN	Mongolia
MR	Mauritania
MW	Malawi
NL	Netherlands
NO	Norway
NZ	New Zealand
PL	Poland
PT	Portugal
RO	Romania
RU	Russian Federation
SD	Sudan
SE	Sweden
SK	Slovak Republic
SN	Senegal
SU	Soviet Union
TD	Chad
TG	Togo
UA	Ukraine
US	United States of America
VN	Viet Nam

VENTILATION SYSTEM

The present invention relates to a ventilation system, comprising a central fan for providing basic ventilation in one or more rooms in a building and at least one range hood for sucking up cooking odors, which is connected via a kitchen flue to the central fan.

Ventilation systems of this type have been well known for many years, where opening or closing a damper in the range hood controls the rotational speed of the central fan, so that during cooking it will suck up a much larger air flow than the basic ventilation flow. One problem with such systems is, however, that it can be difficult, given a reasonable capacity of the central fan, to achieve sufficient flow through the range hood when preparing food which gives rise to powerful cooking odors, which can of course be very unpleasant to the person cooking. This problem is particularly accentuated in multi-unit dwellings where several people are cooking food at the same time. Another problem is that leakage in kitchen flues and other exhaust ducts gives rise to noise when there is significant negative pressure.

The purpose of the present invention is to remove or to at least substantially alleviate these problems by means of a ventilation system which, in addition to providing a certain basic ventilation, can also assure the desired exhaust flow during cooking, achieving this without creating significant negative pressure in the ducts to the suction side of the central fan.

According to the invention, this is achieved with a ventilation system of the type described by way of introduction which is characterized in that a fan is added to the range hood or hoods, the suction side of said fan

being connected to the space under the range hood and the pressure side being connected to the kitchen flue. In addition to removing the above-mentioned problems, the pressure losses are reduced in a system according to the invention in comparison with the described known system, and this saves energy during the operation of the system. Furthermore, a central fan can be used with a smaller capacity than that in the known described system, and this also reduces initial installation costs.

One embodiment of the invention will now be described with reference to the accompanying Figures, in which:
Fig. 1 shows a schematic perspective view of a range hood according to one embodiment of the invention with a partially cut-away outer casing, and
Fig. 2 shows a schematic view of a multi-unit dwelling provided with the ventilation system according to the invention.

Fig. 1 shows a range hood 1 comprising an intake opening 2 for sucking in air and cooking odors from the space under the hood, and a damper 3, which, in its closed position has an adjustable ventilation opening 4 to provide, in a known manner, basic ventilation to the kitchen in which the range hood is installed. The damper 3 is operated by means of a control knob 5 between the completely opened and the completely closed positions. Furthermore, an easily removeable filter 6 is mounted in the intake opening 2. In Fig. 1, it is shown removed from the opening 2. The components of the range hood 1 described up to now are of a type which are known per se.

According to the invention, a radial fan 7 is mounted in the range hood 1, the suction side of said fan being connected to the opening 2 and the pressure side of said fan being connected to a kitchen flue (not shown in

Fig. 1) via the damper 3. The fan 7 is operated by means of the control knob 8, which can, for example, provide three different operating speeds for the fan.

The invention is of course not limited to being applied to a range hood of the type described here. Rather, it can be applied to all known range or cooker hoods which allow for the addition of a fan. Furthermore, other types of fans can also be used than that shown in Fig. 1, as will be easily understood by the person skilled in the art. A detailed description of the components of the range hood is therefore not necessary here for understanding or working the invention.

One embodiment of a ventilation system according to the invention and installed in a multi-unit dwelling is shown schematically in Fig. 2. This ventilation system comprises a central fan 9, the suction side of which is connected to the cooking flues and all the kitchens in the building as well as to the other exhaust ducts in the building. The pressure side of the fan is connected to the outside air. Fig. 2 only shows the kitchen flues 10 from the kitchen units and the exhaust ducts 11 from the bathrooms. Additional exhaust ducts may also be connected to the suction side of the central fan 9. As can be seen in the Figure, the kitchen flues 10 and the exhaust ducts 11 come together in a collection duct 12. The range hoods 1 in the kitchens each have, in accordance with the invention, a built-in fan as was described with reference to Fig. 1.

The ventilation system also comprises a regulator means 13, which regulates the rotational speed of the central fan 9 depending on the pressure sensed in the collection duct 12. This regulator means comprises a pressure controlled speed regulator of any suitable type and a

pressure sensor which provides control signals to the speed regulator.

The ventilation system according to the invention functions in the following manner.

In normal operation when no cooking is being done in any of the kitchens in the building, the central fan 9 is driven at constant rpm and sucks out a pre-determined volume of air per unit of time from each room having an exhaust duct, thus providing a so-called basic ventilation. The opening 4 in the damper 3 (see Fig. 1) is dimensioned so that the desired basic ventilation is provided in the kitchens of the building.

If any of the dampers 3 is opened to evacuate cooking odors from the space below the range hood in question, the rpm of the central fan 9 is increased by virtue of the fact that the adjustment of the control knob 5 is coupled to the motor of the central fan either directly or via the speed regulator of the regulator means 13. Preferably, the regulator means 13 is only designed to assure that a pre-determined negative pressure is not exceeded in the collector duct 12, i.e. in practice to prevent positive pressure from developing in the exhaust ducts 11 and other exhaust ducts not shown in Fig. 2 which are connected to the collection duct 12. The rpm of the central fan is then directly controlled by the control knob 5. The central fan is preferably driven at only two basic speeds, a first speed to provide basic ventilation and a second speed to provide evacuation of cooking odors to a limited extent. If an additional one or more dampers are opened in the range hoods 1 in the house, no additional increase in the rpm of the central fan 9 will occur. This means that the more dampers that are opened, the poorer will be the capacity of each range hood to evacuate cooking odors.

If the capacity of each individual range hood is insufficient to evacuate cooking odors, the built-in fan 7 in the range hood is started. This makes the capacity of each individual range hood 1 sufficient to always be able to provide the desired suction capacity regardless of the operating states of the other range hoods. When the fan 7 is operating, a positive pressure is created in the associated kitchen flue 10, at least in its portion closest to the fan 7. In order to make sure that this positive pressure is not propagated from the kitchen flue(s) 10 to the other exhaust ducts and to thereby prevent cooking odors from penetrating into the rooms where the exhaust ducts are connected, the pressure in the collection duct 12 is regulated with the aid of regulator means 13 and the fan 9, so that a certain amount of negative pressure always prevails in the collection duct. Theoretically, it is conceivable that the pressure in the collection duct can be allowed to rise to the pressure prevailing inside the house, but to be on the safe side, it is preferable that the regulator means 13 be calibrated to maintain a pressure in the collection duct which is lower than the pressure in the house. If it should occur that the pressure rises in the collection duct 12 above a pre-determined negative pressure, the regulator means 13 will increase the rotational speed of the central fan so that the pressure is reduced, the central fan being driven at a higher rpm than its second basic rpm.

In addition to assuring that there will be sufficient suction capacity for cooking odors in each individual range hood in a ventilation system according to the invention, a number of other advantages are provided over a conventional range hood system with basic ventilation. For example, the pressure differences in the kitchen flues will be less than in a conventional system due to the fact that the positive pressure created by the fan 7

is partly cancelled by the negative pressure created by the central fan. This means that the pressure losses in the flow ducts will be less than if the same suction capacity in the range hood were achieved only with the aid of negative pressure, and this reduces the total energy consumption. Furthermore, significant negative pressures in the kitchen ducts give rise to noise problems if the ducts leak, and these problems are reduced in a system according to the invention in which the absolute value of the pressure in the kitchen ducts is less than in systems which only works by negative pressure in the kitchen ducts to provide a corresponding suction capacity in the range hoods.

A ventilation system according to the invention can of course also be applied in a single unit dwelling. For such an application, the central fan is dimensioned and operated so that a small negative pressure is created in the collection duct when the fan in the range hood is operated. In this case no pressure controlled regulator means is required for the central fan. The central fan can then be controlled with the same control means used to control the speed of the range hood fan, and thus it is simple to assure that the central fan can create a negative pressure in the collection duct. In order to permit forced ventilation in the ventilation system, the starting of the range hood fan is coupled to the control for opening the damper, i.e. the speed control of the range hood fan is only effective when the damper is open.

A number of modifications of the ventilation system described are of course possible within the scope of the invention. For example, the exhaust ducts 11 can consist of separate ducts leading to the collection duct 12 in the same manner as the kitchen flues 10. In order to make sure that the positive pressure in a kitchen flue is not propagated to the other kitchen flues, the kitchen flues

are preferably made as separate ducts. Furthermore, the regulator means 13 can be made to provide a constant negative pressure in the collection duct and thus continuously control the rpm of the central fan instead of, as in the described embodiment, only being in operation in practice when the range hood fan(s) is or are being operated. In order to prevent unintentional operation of the range hood fan, for example when it is not shut off after finished cooking, the unit according to the invention can be advantageously provided with a device for automatically shutting off the fan after a pre-determined period of operation, e.g. one hour.

CLAIMS

1. Ventilation system, comprising a central fan (9) for providing basic ventilation in one or more rooms in a building and at least one range hood (1), for sucking up cooking odors, which range hood is connected via a kitchen flue (10) to the central fan, c h a r a c t - e r i z e d in that a fan (7) is added to the range hood or hoods (1), the suction side of said fan being connected to the space under the range hood and the pressure side of said fan being connected to the kitchen flue (10).

2. Ventilation system according to Claim 1, c h a r a c t e r i z e d in that it comprises a regulator means (13), which controls the central fan (9) in such a manner that a positive pressure only arises in the kitchen flue (10) connected to each range hood (1).

3. Ventilation system according to Claim 2, c h a r a c t e r i z e d in that kitchen flues (10) and other exhaust ducts (11) in the building lead into a collection duct (12) connected to the suction side of the central fan (9), that the regulator means (13) comprises a pressure sensor which senses the pressure in the collection duct, and a speed regulator which controls the rotational speed of the central fan (9) as a function of the pressure sensed.

4. Ventilation system according to Claim 3, c h a r a c t e r i z e d in that the regulator means (13) is arranged to control the central fan (9) so that a constant negative pressure is maintained in the collection duct (12).

5. Ventilation system according to one of the preceding Claims, c h a r a c t e r i z e d in that the range hood or hoods (1) comprise(s) a damper (3) with a ventilation opening (4) of a type known per se, said damper being operable between a closed position in which the connection to the associated kitchen flue (10) is closed and an opened position in which this connection is open, and a control means coupled to the operation of the damper to increase the rotational speed of the central fan (9) when the damper is moved to its opened position.

6. Ventilation system according to Claim 2, c h a r a c t e r i z e d in that the range hood (1) comprises a damper (3) with a ventilation opening (4) of a known type, said damper being operable between a closed position in which the connection to the associated kitchen flue (10) is closed, and an opened position in which this connection is open, a control device coupled to the operation of the damper to control the starting of the range hood fan, and an operating device which controls in conjunction the speeds of the central fan and the range hood fan, the speed control for the range hood fan only being in effect when the damper has been moved to its opened position.

7. Ventilation system according to one of the preceding Claims, c h a r a c t e r i z e d by a device which automatically shuts off the fan (7) of the range hood (1) after a pre-determined period of operation.

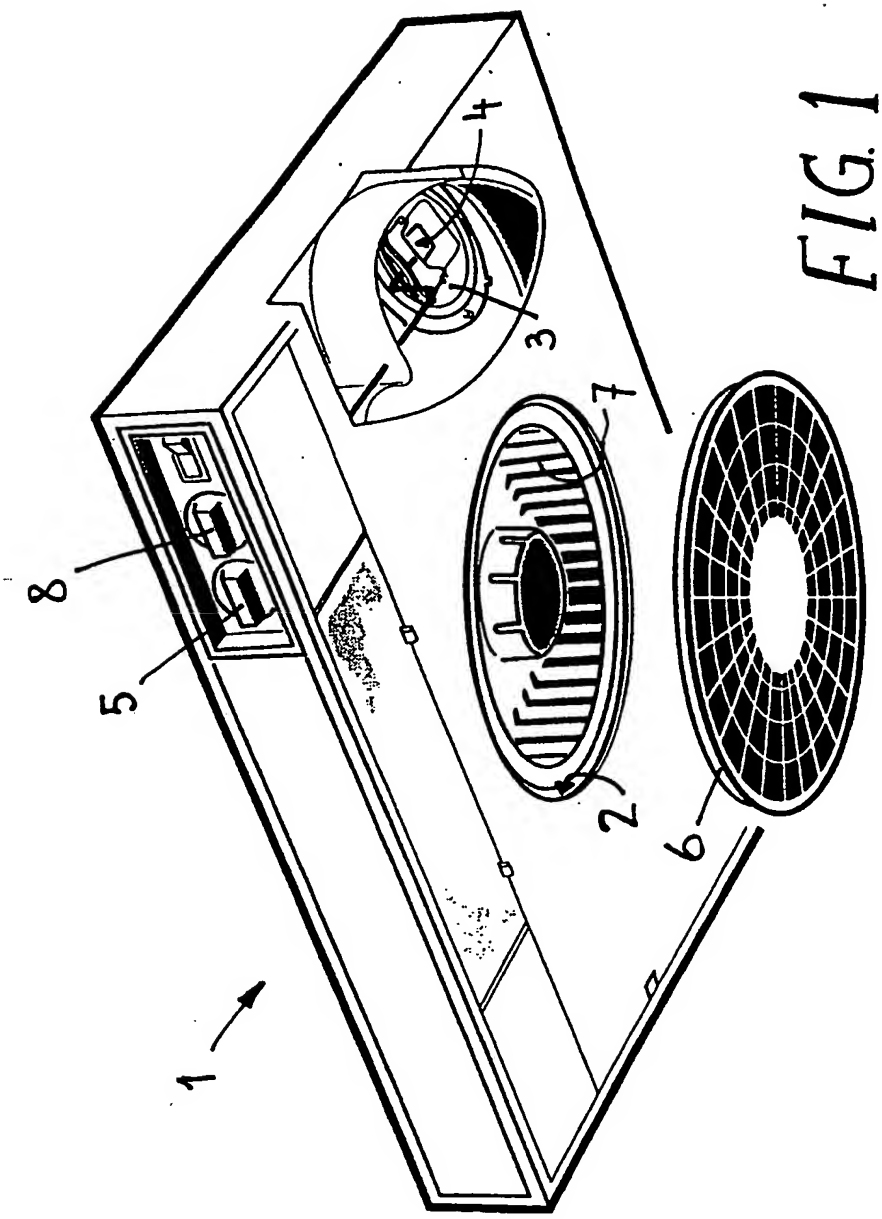


FIG 1

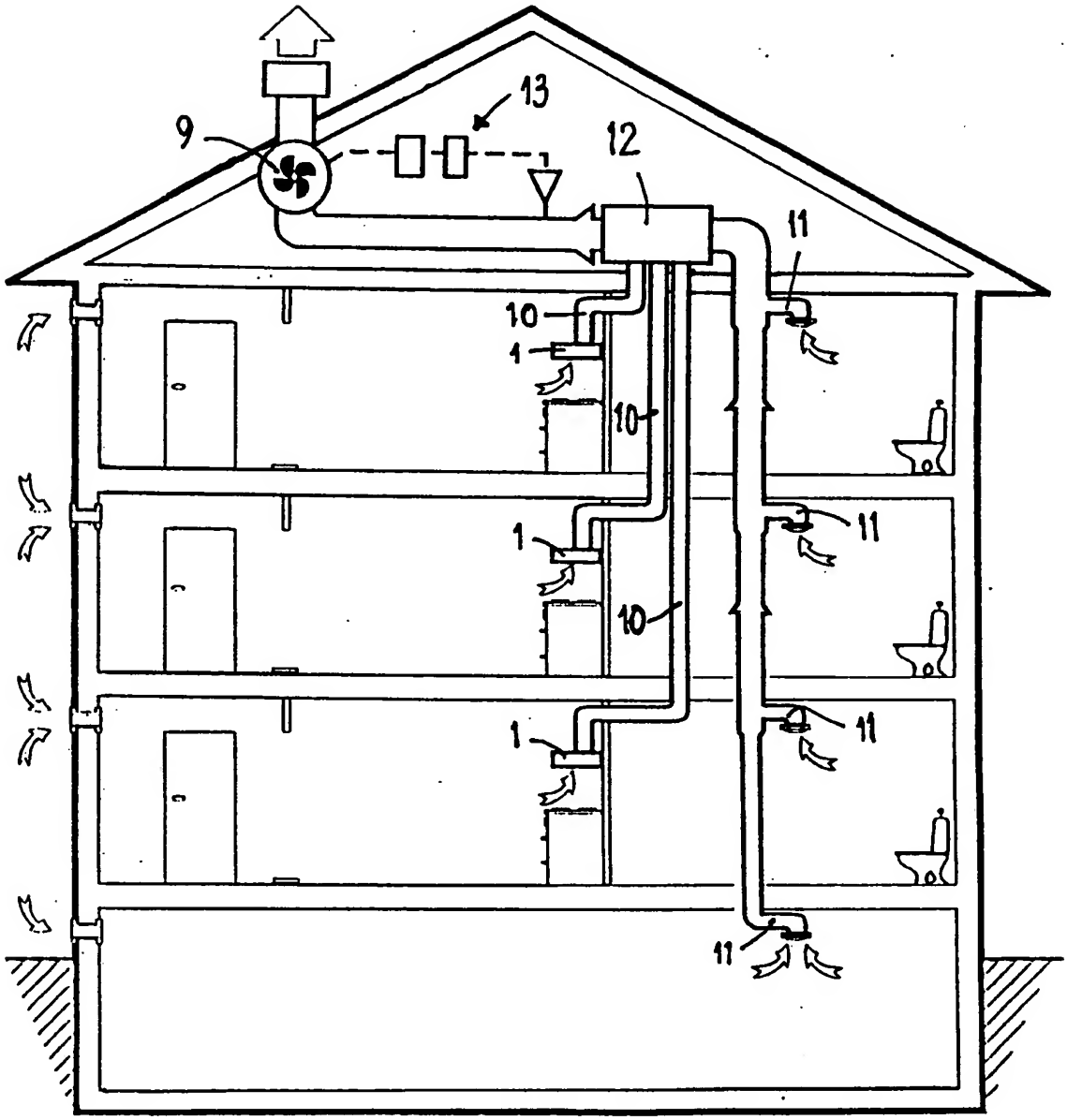


FIG.2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 93/00029

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: B08B 15/02, F24C 15/20
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: B08B, F24C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE, A1, 2259670 (COMETAL, CHATEAU-GONTIER), 14 June 1973 (14.06.73), page 8, line 22 - line 25, figure 6, claim 5	1,5,7
A	US, A, 3691931 (PERSSON), 19 Sept 1972 (19.09.72), column 3, line 7 - line 20, figure 1, abstract	1-7
A	WO, A1, 9008922 (MELINK, STEPHEN, K.), 9 August 1990 (09.08.90), abstract	1-7

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 April 1993	27 -04- 1993
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Hans Presto Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

31/03/93

International application No.

PCT/SE 93/00029

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A1- 2259670	14/06/73	BE-A- 792270	30/03/73
		FR-A- 2163927	27/07/73
		NL-A- 7216603	12/06/73
US-A- 3691931	19/09/72	NONE	
WO-A1- 9008922	09/08/90	AU-A- 5102390	24/08/90
		US-A- 4903685	27/02/90